CLAIMS

1. A light-emitting device comprising:

a transparent or semi-transparent first substrate;

a second substrate provided opposite to the first substrate;

a transparent or semi-transparent first electrode provided on the first substrate;

a second electrode provided on the second substrate so as to be opposite to the first electrode; and

a light-emitting layer which contains a metal oxide semiconductor porous body, by the surface of which an organic light-emitting material is supported, and is provided between the first electrode and the second electrode.

2. The light-emitting device according to claim 1, wherein the metal oxide semiconductor porous body is composed of a metal oxide semiconductor particulate powder.

3. The light-emitting device according to claim 2, wherein the metal oxide semiconductor particulate powder is made of an n-type semiconductor material.

4. The light-emitting device according to any one of claims 1 to 3, wherein the organic light-emitting material is chemisorbed to the surface of the metal oxide semiconductor porous body.

5. The light-emitting device according to any one of claims 1 to 4, further comprising at least one organic layer provided between the first electrode and

the second electrode in addition to the light-emitting layer, the organic layer containing an adhesive organic material so as to function as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

6. The light-emitting device according to claim 5, further comprising a spacer dispersed in the organic layer, by which the thickness of the organic layer is defined.

7. The light-emitting device according to claim 6, wherein the spacer is composed of transparent or semi-transparent particles.

8. The light-emitting device according to claim 6 or 7, wherein the spacer is made of an insulating material.

9. The light-emitting device according to any one of claims 6 to 8, wherein the particle diameter of the spacer is in the range of 0.01 to 10 μm.

10. The light-emitting device according to claim 5, wherein the adhesive organic material contained in the organic layer contains at least a polymer-based material.

11. The light-emitting device according to any one of claims 5 to 10, wherein the first substrate is a glass substrate.

12. The light-emitting device according to any one of claims 5 to 11, further

comprising a low-refractive-index layer provided between the first substrate and the first electrode.

13. The light-emitting device according to any one of claims 5 to 12, wherein the first electrode is an electron injection electrode, the second electrode is a hole injection electrode, and the organic layer is a hole transport layer, and wherein the hole transport layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

14. The light-emitting device according to any one of claims 5 to 12, wherein the first electrode is a hole injection electrode, the second electrode is an electron injection electrode, and the organic layer is a hole transport layer, and wherein the hole transport layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

15. The light-emitting device according to any one of claims 5 to 12, further comprising a hole transport layer, wherein the first electrode is an electron injection electrode, the second electrode is a hole injection electrode, the hole transport layer is provided between the light-emitting layer and the hole injection electrode, and the organic layer is an electron transport layer, and wherein the electron transport layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

16. The light-emitting device according to any one of claims 5 to 12, further comprising a hole transport layer, wherein the first electrode is a hole injection

electrode, the second electrode is an electron injection electrode, the hole transport layer is provided between the light-emitting layer and the hole injection electrode, and the organic layer is an electron transport layer, and wherein the electron transport layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

17. The light-emitting device according to any one of claims 5 to 12, further comprising a hole transport layer, wherein the first electrode is an electron injection electrode, the second electrode is a hole injection electrode, the hole transport layer is provided between the light-emitting layer and the organic layer, and the organic layer is a hole injection layer, and wherein the hole injection layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

18. The light-emitting device according to any one of claims 5 to 12, further comprising a hole transport layer, wherein the first electrode is a hole injection electrode, the second electrode is an electron injection electrode, the hole transport layer is provided between the light-emitting layer and the organic layer, and the organic layer is a hole injection layer, and wherein the hole injection layer functions as an adhesive layer through which adjacent upper and lower layers thereof are bonded together.

19. The light-emitting device according to any one of claims 13 to 16, further comprising a hole injection layer provided between the hole injection electrode and the hole transport layer.

20. The light-emitting device according to any one of claims 13, 14, 17, and 18, further comprising an electron transport layer provided between the electron injection electrode and the light-emitting layer.

21. The light-emitting device according to claims 13, 15, or 17, wherein the hole injection electrode has a black color.

22. The light-emitting device according to claim 21, wherein the hole injection electrode having a black color is composed of a p-type semiconductor material.

23. The light-emitting device according to claims 13, 14, 17, or 18, further comprising a metal oxide semiconductor layer provided between the electron injection electrode and the light-emitting layer containing the metal oxide semiconductor porous body.

24. The light-emitting device according to claim 23, wherein the metal oxide semiconductor layer is composed of an n-type semiconductor material.

25. The light-emitting device according to any one of claims 1 to 24, further comprising a thin film transistor connected to the second electrode.

26. The light-emitting device according to claim 25, wherein the thin film transistor is an organic thin film transistor composed of a thin film containing an

organic material.

27. A display comprising:

a light-emitting device array in which the plurality of light-emitting devices according to claim 25 or 26 are two-dimensionally arrayed;

a plurality of x electrodes extending in parallel with each other in a first direction parallel to the surface of the light-emitting device array; and

a plurality of y electrodes extending in parallel with each other in a second direction parallel to the surface of the light-emitting device array and perpendicular to the first direction, wherein each of the thin film transistors of the light-emitting device array is connected to the x electrode and the y electrode.

28. The display according to claim 27, further comprising a region composed of a metal oxide semiconductor porous body by the surface of which a black dye is supported, by which the adjacent plurality of light-emitting devices two-dimensionally arrayed are separated from each other.

29. The light-emitting device according to any one of claims 1 to 4, further comprising:

a thin film transistor connected to the second electrode; and

an adhesive layer provided between the second substrate including the thin film transistor and the second electrode, through which the adjacent upper and lower layers thereof are bonded together.

30. The light-emitting device according to claim 29, further comprising a

spacer dispersed in the adhesive layer, by which the thickness of the adhesive layer is defined.

31. The light-emitting device according to claim 30, wherein the spacer is made of an insulating material.

32. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent electron injection electrode on the first substrate;

forming a porous body composed of a metal oxide semiconductor particulate powder on the electron injection electrode;

allowing an organic light-emitting material to be supported by the surface of the porous body;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming a hole injection electrode on the thin film transistor;

forming a hole transport layer on the hole injection electrode;

allowing the porous body provided on the first substrate and the hole transport layer provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the porous body provided on the first substrate and the hole transport layer provided on the second substrate together.

33. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent hole injection electrode on the first substrate;

forming a hole transport layer on the hole injection electrode;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming an electron injection electrode on the thin film transistor;

forming a porous body composed of a metal oxide semiconductor particulate powder on the electron injection electrode;

allowing an organic light-emitting material to be supported by the surface of the porous body;

allowing the hole transport layer provided on the first substrate and the porous body provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the hole transport layer provided on the first substrate and the porous body provided on the second substrate together.

34. The method for manufacturing a light-emitting device according to claim 32 or 33, further comprising dispersing a spacer in the hole transport layer.

35. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent electron injection electrode on the first substrate;

forming an electron transport layer on the electron injection electrode;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming a hole injection electrode on the thin film transistor;

forming a hole transport layer on the hole injection electrode;

forming a porous body composed of a metal oxide semiconductor particulate powder on the hole transport layer;

allowing an organic light-emitting material to be supported by the surface of the porous body;

allowing the electron transport layer provided on the first substrate and the porous body provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the electron transport layer provided on the first substrate and the porous body provided on the second substrate together.

36. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent hole injection electrode on the first substrate;

forming a hole transport layer on the hole injection electrode;

forming a porous body composed of a metal oxide semiconductor particulate powder on the hole transport layer;

allowing an organic light-emitting material to be supported by the surface of the porous body;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming an electron injection electrode on the thin film transistor;

forming an electron transport layer on the electron injection electrode;

allowing the porous body provided on the first substrate and the electron transport layer provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the porous body provided on the first substrate and the electron transport layer provided on the second substrate together.

37. The method for manufacturing a light-emitting device according to claim 35 or 36, further comprising dispersing a spacer in the electron transport layer.

38. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent electron injection electrode on the first substrate;

forming a porous body composed of a metal oxide semiconductor particulate powder on the electron injection electrode;

allowing an organic light-emitting material to be supported by the surface of the porous body to provide a light-emitting layer;

forming a hole transport layer on the light-emitting layer containing the porous body;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming a hole injection electrode on the thin film transistor;

forming a hole injection layer on the hole injection electrode;

allowing the hole transport layer provided on the first substrate and the hole injection layer provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the hole transport layer provided on the first substrate and the hole injection layer provided on the second substrate together.

39. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent hole injection electrode on the first substrate;

forming a hole injection layer on the hole injection electrode;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming an electron injection electrode on the thin film transistor;

forming a porous body composed of a metal oxide semiconductor particulate powder on the electron injection electrode;

allowing an organic light-emitting material to be supported by the surface of the porous body to provide a light-emitting layer;

forming a hole transport layer on the light-emitting layer containing the porous body;

allowing the hole injection layer provided on the first substrate and the hole transport layer provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the hole injection layer provided on the first substrate and the hole transport layer provided on the second substrate together.

40. The method for manufacturing a light-emitting device according to claim 38 or 39, further comprising dispersing a spacer in the hole injection layer.

41. A method for manufacturing a light-emitting device, comprising:

preparing a transparent or semi-transparent first substrate;

forming a transparent or semi-transparent electron injection electrode on the first substrate;

forming a porous body composed of a metal oxide semiconductor particulate powder on the electron injection electrode;

allowing an organic light-emitting material to be supported by the surface of the porous body to provide a light-emitting layer;

forming a hole transport layer on the light-emitting layer containing the porous body;

forming a hole injection electrode on the hole transport layer;

preparing a second substrate;

forming a thin film transistor on the second substrate;

forming an adhesive layer on the thin film transistor;

allowing the hole injection electrode provided on the first substrate and the adhesive layer provided on the second substrate to be opposed to each other to carry out alignment in accordance with a pixel pitch; and

bonding the hole injection electrode provided on the first substrate and the adhesive layer provided on the second substrate together.

42. The method for manufacturing a light-emitting device according to claim

41, further comprising dispersing a spacer in the adhesive layer.